WHFS - WFO HYDROLOGIC FORECAST SYSTEM
REVISION 5.2.2

OPERATIONAL USER'S GUIDE AND TRAINING MANUAL

HYDROLOGIC DATA VIEWING SYSTEM
RIVER PRODUCT FORMATTER
HYDROLOGIC DATABASE

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1. What is the WHFS?

Introduction

The Weather Forecast Office (WFO) Hydrologic Forecast System (WHFS) is an integrated system of hydrologic software that is used by Service Hydrologists and hydrology focal points in the management of WFO hydrology programs. It provides a tool for all WFO operational staff (as opposed to just hydrologists) to use in the conduct of hydrologic operations for the WFO Hydrologic Service Area (HSA) such as issuance of products for flash floods and main-stem river flood episodes.

The WHFS software works in conjunction with observed hydrometeorological data and the River Forecast Center (RFC) guidance and was designed for ease of use, with the meteorologist in mind. The various components of the WHFS allow the forecaster to monitor hydrologic conditions and events, manage hydrologic and meteorological data, and generate public products when appropriate. The WHFS automates the generation and issuance of river statements, flood warnings, flood statements, and other products for locations defined in the WFO's database.

Many WHFS software system components can be accessed through an interactive graphical user interface (GUI). The GUI enhances the usefulness of the WHFS as a tool for the forecaster because of its ease of use in viewing and editing data and information.

The WHFS is designed to easily allow for future revisions as software capabilities are developed or improved. The WHFS was developed under C/X-Windows/Motif standards and interacts with an Informix relational database of hydrologic-oriented information (the Integrated Hydrologic Forecast System data base, IHFS_DB). The WHFS will be integrated with other Advanced Weather Interactive Processing System (AWIPS) components in the future. These other AWIPS components include the WFO-Advanced package, which is used to display graphical information such as atmospheric model outputs, satellite imagery, and radar information, and the Interactive Forecast Preparation System (IFPS), which is used to produce forecaster-modified fields of graphical information such as temperature and quantitative precipitation forecasts. The WHFS, WFO-Advanced, and IFPS execute on the same AWIPS platform. Future AWIPS upgrades will incorporate these components in a more integrated database and graphical user interface environment that may, for example, alarm a forecaster viewing a meteorological graphic that a River Forecast Center (RFC) guidance product (e.g., flash flood guidance or FFG) has been received.

WHFS Components

The **Hydrologic Database Manager (HydroBase), Hydrologic Data Viewing System (HydroView)** and **River Product Formatter (RiverPro)** form a suite of WHFS applications used for hydrologic monitoring, public product generation, and data management. Both HydroView and RiverPro extract data resident in the IHFS to perform various operational functions.

The core WHFS components are graphically displayed in Figure 1.

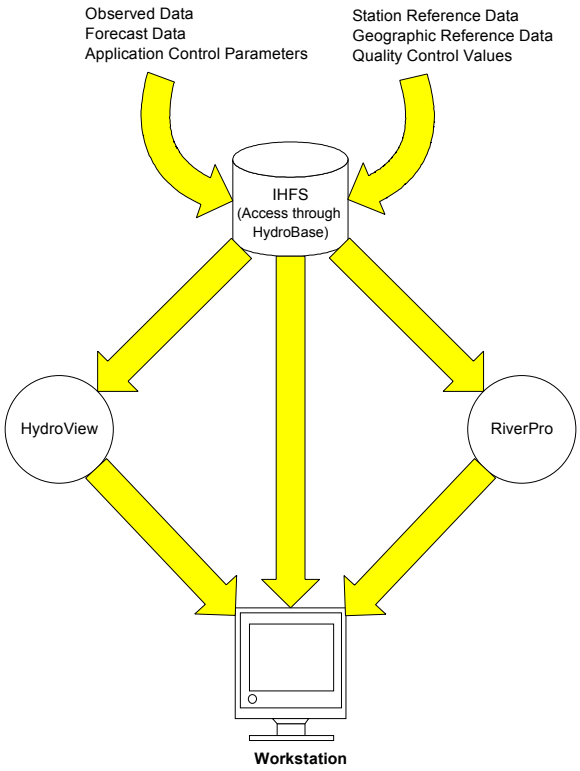

Figure 1. WHFS Core Components

An overview of each component is provided below.

> **HydroView** is the key operational component of the WHFS for the meteorological forecaster. The forecaster can use HydroView to monitor hydrologic situations and events and to display hydrologic and meteorological data in tabular and time series formats. (A time series is a one-dimensional array of observed data or computed values for a period of time, such as a sequence of 6-hourly river stage readings.) HydroView provides a geographic view of the Hydrologic Service Area with various hydrometeorological data collection

stations and forecast points, which are color coded based on their flood status (i.e., as an action stage or flood stage). Collection station data can be displayed as an icon only or as both the station icon and the user-selected data element value. Precipitation data can be displayed for various durations up to 72 hours and for a specified ending time. HydroView also permits the forecaster to overlay areal and gridded data displays. Areal displays for basins, counties, and zones include Mean Areal Precipitation (MAP) and Flash Flood Guidance (FFG). The forecaster can also display comparisons of observed precipitation and flash flood guidance in order to better assess flash flood threats. Using HydroView, the forecaster can access detailed information regarding dams and reservoirs within the HSA, including pre-calculated forecasts of flow, stage and transit times for a dam break scenario. In WHFS Version 5.2.2, the HydroView utility is integrated with the Multi-sensor Precipitation Estimator (MPE) to produce a single, interactive utility that enables the forecaster to monitor dynamic, hydrologic events. The integrated utility, **HydroView_MPE**, provides the forecaster with the ability to interactively monitor multi-sensor rainfall estimates, as well as detailed point data and flash flood guidance. While Version 5.2.2 provides both HydroView and HydroView_MPE as discrete applications, the non-MPE version of HydroView will eventually be dropped from the WHFS.

RiverPro automates the generation and issuance of river statements, flood warnings, flood statements, and other products for locations defined in the WFO's database. RiverPro extracts observed and forecast river stages from the hydrologic data base and compares these data to threshold stage values that represent flood categories. Based on this analysis of current or forecast hydrologic conditions and, when applicable, the history of recently issued products, RiverPro determines a recommended product (e.g., Flood Warning) applicable to recommended locations within the Hydrologic Service Area. The forecaster then has the option to accept the RiverPro-generated recommendation and to use predefined templates that specify the product format and content or to edit and specify which product (statement or warning) to issue and which locations to include in the product. Based on customized instructions, RiverPro will issue the product once all reviews and edits are complete. RiverPro also displays various data and information to assist the forecaster in determining which products are appropriate to issue.

HydroBase manages the static information for the hydrometeorological data collection stations and forecast points located throughout the Hydrologic Service Area. HydroBase is interactive, which allows for adding, editing, and displaying the static data and information that are used by both HydroView and RiverPro. HydroBase also produces various reports such as a graphical flood report, WS Form E-19 Report, a modified version of the WS Form B-44 Report referred to as B-44a, a station list report, and a station classification report. Reports can be viewed, printed, or e-mailed from the HydroBase application.

The forecaster will primarily use HydroView_MPE and RiverPro in performing WFO hydrologic operations. HydroBase screens will be used by the forecaster for informational purposes only. The static data and information accessed in HydroBase that are used by the forecaster in monitoring a hydrologic event are also displayable through HydroView. Maintaining HydroBase is the function of the Service Hydrologist. The forecaster should interact with the Service Hydrologist regarding the HydroBase database. Access to HydroBase can be controlled through use of the optional password function. The password is set in HydroBase.

Purpose of this Manual

This manual has been designed to be both a training guide and a user's manual for the operations of the WHFS. It is meant to aid the forecaster and Service Hydrologist in using the WHFS to perform the hydrologic operations of the WFO. Information in the manual is presented from an operational point-of-view and focuses on the user interface. Therefore, WHFS displays and applications that are key in performing hydrologic operations have the primary focus.

Located throughout the manual are user-friendly tips and notes regarding use of the various functions and operations in the WHFS. These should prove helpful when operating the system.

For additional information regarding basic hydrology, hydrologic data and information, WFO hydrologic operations, and WFO/RFC responsibilities, refer to *Correspondence Course - Operations of the NWS Hydrologic Services Program, March 1997 (and corresponding updates)*.

2. Overview of the WHFS

The following sections provide an overview of the functions of the WHFS components. The operational uses for each component are discussed in more detail in subsequent sections of this manual.

HydroView_MPE

The HydroView_MPE application consolidates the Hydrologic Data Viewing System (HydroView) and the Multi-sensor Precipitation Estimator (MPE) into a single, interactive, versatile utility that enables the forecaster to monitor dynamic, hydrologic events.

The HydroView focus is primarily on the display of point hydrometeorological data, such as river and stream gage readings, precipitation amounts, and similar environmental information, which are typically observed and forecast for a specific location. It assists in the preparation of hydrologic forecasts by allowing the user to display and edit these data as well as station reference information such as river action and flood stages, historic river crests, emergency contacts, river rating curves, and dam catalogs.

The MPE focus is on areal estimations based on both remotely sensed data (radar, satellite) and actual observations (rain gages). It creates hourly, gridded, multi-sensor precipitation estimates on a 4-km Hydrologic Rainfall Analysis Project (HRAP) grid. The primary inputs to MPE are the gridded Digital Precipitation Array (DPA) products, which provide radar estimates on a 4-km grid, and precipitation gage data. The main steps involved in creating the multi-sensor estimate include determining a mean field bias adjustment, creating a multi-radar mosaic, and merging the mosaic with precipitation gage observations. One of the important features of HydroView_MPE is the ability to edit the gridded data fields and the point gage observations. In the process of performing these operations, multiple types of precipitation grids are generated, with one of the resulting grids designated as the "best" grid. At RFCs, the best grid is then used to produce MAPX time series for input into NWSRFS.

The combination of HydroView functionality and MPE functionality into a single application provides the forecaster with the ability to interactively monitor multi-sensor rainfall estimates, detailed point data, and flash flood guidance. The data that are monitored in HydroView_MPE are managed by HydroBase and used by RiverPro.

> HydroView_MPE is more than a data display tool. Its user-friendly displays are intended for operational use. The data and information graphical displays are useful analytical tools for timely monitoring of events and for verifying the accuracy of products prior to their dissemination to the public.

Key features of HydroView_MPE include the following.

For Specific Data Points

- Displays locations of river forecast points, river data points, and reservoir stations on a geographic display with color coding indicating flood status;
- Displays locations of other hydrometeorological data collection stations (e.g., precipitation, temperature) and cooperative observers on the geographic display;
- Displays station identifiers and observed and forecast data values (e.g., precipitation totals, river stage) for forecast points and other collection stations; and
- Plots time series of various types of hydrologic and meteorological data, including river stage and precipitation.

For the Geographic Area

- Displays Flash Flood Guidance (FFG) as issued by the appropriate River Forecast Center (RFC) as an average value over a basin or on an HRAP Grid at either a WFO or RFC spatial resolution; and
- Displays gridded MPE areal estimations of rainfall amounts derived from multiple Doppler radar estimates only, gage only, and radar plus gage measurements; and

Comparisons between observed rainfall amounts and Flash Flood Guidance (FFG) are performed using the Flash Flood Monitoring and Prediction (FFMP) application, not HydroView_MPE.

For the HydroView_MPE Geographic Display

- Displays hourly Multisensor Precipitation Estimator (MPE) data based on:
  - < Radar Mosaic Field - Radar Data Only
  - < Gage Only Analysis Field - Gage Data Only
  - < Multisensor Mosaic Field - Radar and Gage Estimate
  - < Field Bias Radar Mosaic - Biased Radar Rainfall Amounts
  - < Local Bias Radar Mosaic - Biased Radar Rainfall Amounts
  - < Best Estimate QPE - "Best Guess" Field

- < Multi-Hour QPE - Multiple Hour Precipitation Estimate
- < Satellite Precip - Time-Lapse Satellite Image (OB2), Future Satellite Precipitation Estimates;

- Displays a table of gages contained within the WFO or RFC area's HRAP Grid;

- Displays a time lapse of MPE data for durations 6 HR, 12 HR, 24 HR, or some user-defined duration in hours;

- Displays a 4-panel window for each radar site, showing:

  - < Raw Radar data
  - < Radar Climatology data
  - < Mean Bias Corrected data
  - < Radar Coverage Map; and

- Displays HydroView_MPE reference field data, such as:

  - < Local Span data
  - < Local Bias data
  - < Height data
  - < Radar Coverage data
  - < PRISM data
  - < Display Bias data
  - < 7 x 7 Grid of HRAP bins centered around a gage.

Other Information and Capabilities

- Displays various geographic map overlays such as streams and lakes, basins, counties, cities, and radar locations and umbrellas;

- Displays observer/contact information, including telephone numbers;

- Allows adding, editing, and managing of observed data;

- Allows the forecaster to select specific precipitation estimates;

- Allows Flash Flood Guidance settings (times and durations) to be displayed;

- Displays products (e.g., river statements, data reports, flood warnings);

- Displays data and information regarding dams in the area of responsibility including pre-calculated forecasts of flow, stage, and travel time for a dam break; and

- Provides various informative displays such as station geophysical information, station reporting status, station precipitation and stage forecasts, data quality control status, crest history, and rating curves.

All user activities in HydroView_MPE begin with the HydroView_MPE Root Window screen, which is shown in Figures 2 through 5. The initial appearance of the HydroView_MPE root window, when the application is started, is in HydroView mode. To display MPE data and enable MPE menu options, the user must open the **MPEcontrol** menu and select **Choose Hour**. HydroView options are always accessible, whether or not MPE data are being displayed. However, the MPE options and data displays can be collectively toggled on by selecting **Choose Hour** on the **MPEcontrol** menu and toggled off by selecting **Clear Data** on the **MPEcontrol** menu.

The HydroView_MPE root window contains the following features.

- A large **Geographic Display** area;

- A **Menu Bar** across the top of the window displaying HydroView_MPE menu options;

- A **Map Toolbar** below the menu bar, which is turned off when HydroView_MPE is started and may be toggled on/off using the **Toolbar** selection on the **Tools** menu; and

- A **Pop Up Menu** that is accessed by clicking the right mouse button when the cursor is within the geographic display area.

The HydroView_MPE root window in HydroView mode is shown in Figure 2.

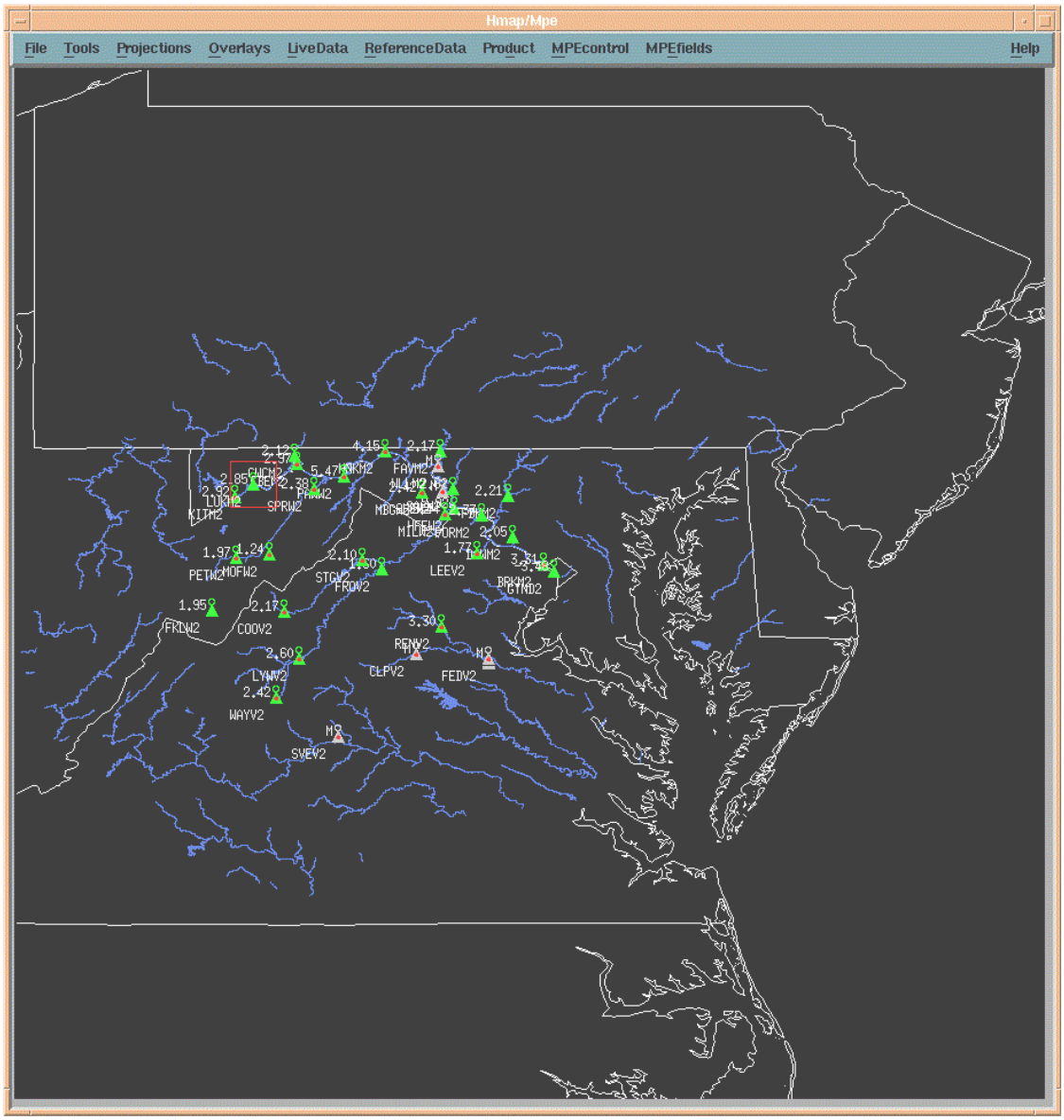

Figure 2. HydroView_MPE Root Window (HydroView Mode)

The HydroView_MPE root window with MPE options and data display toggled on is shown in Figure 3.

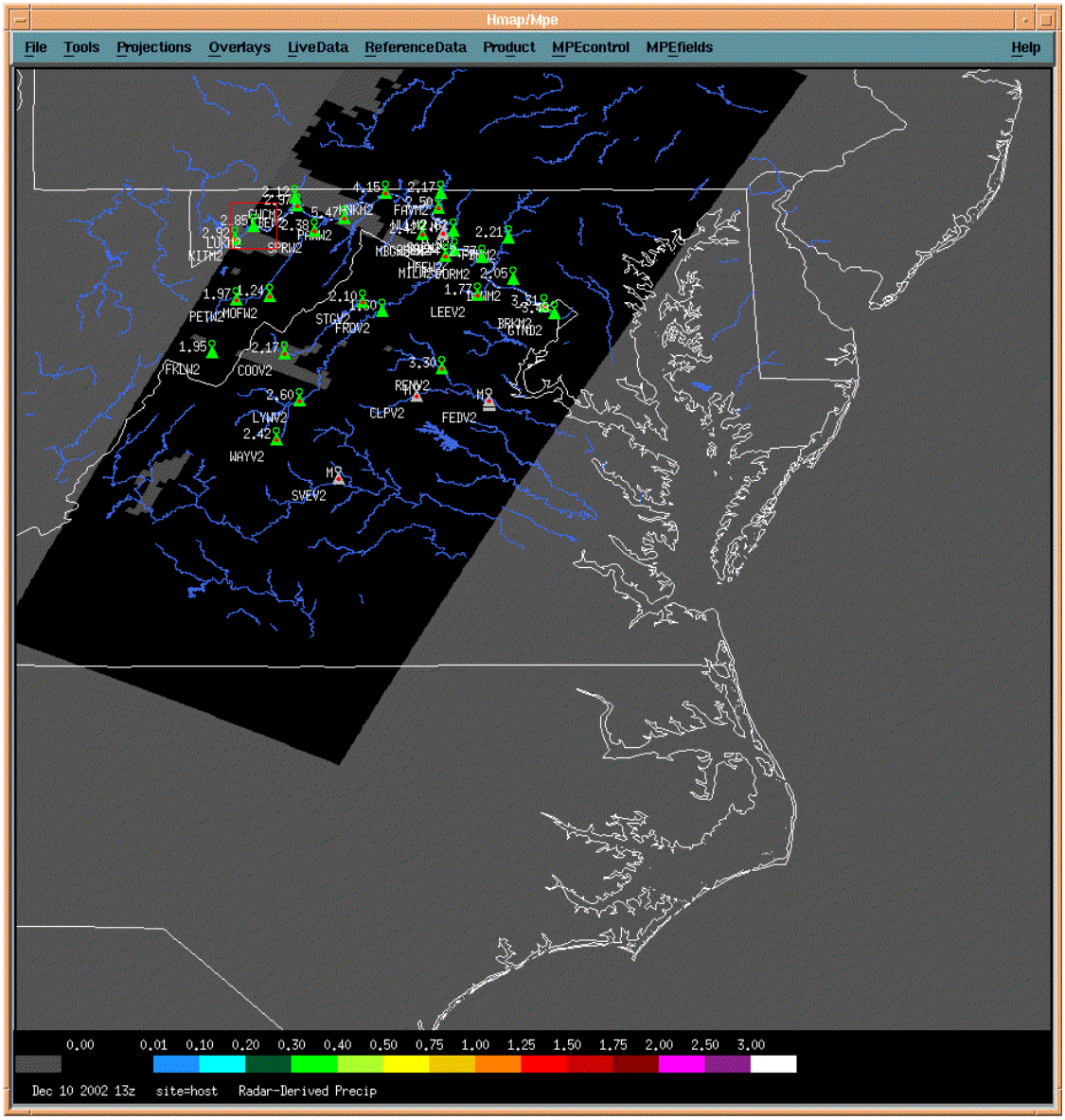

Figure 3. HydroView_MPE Root Window (MPE Mode)

The HydroView_MPE root window with the Map Toolbar turned on is shown in Figure 4.

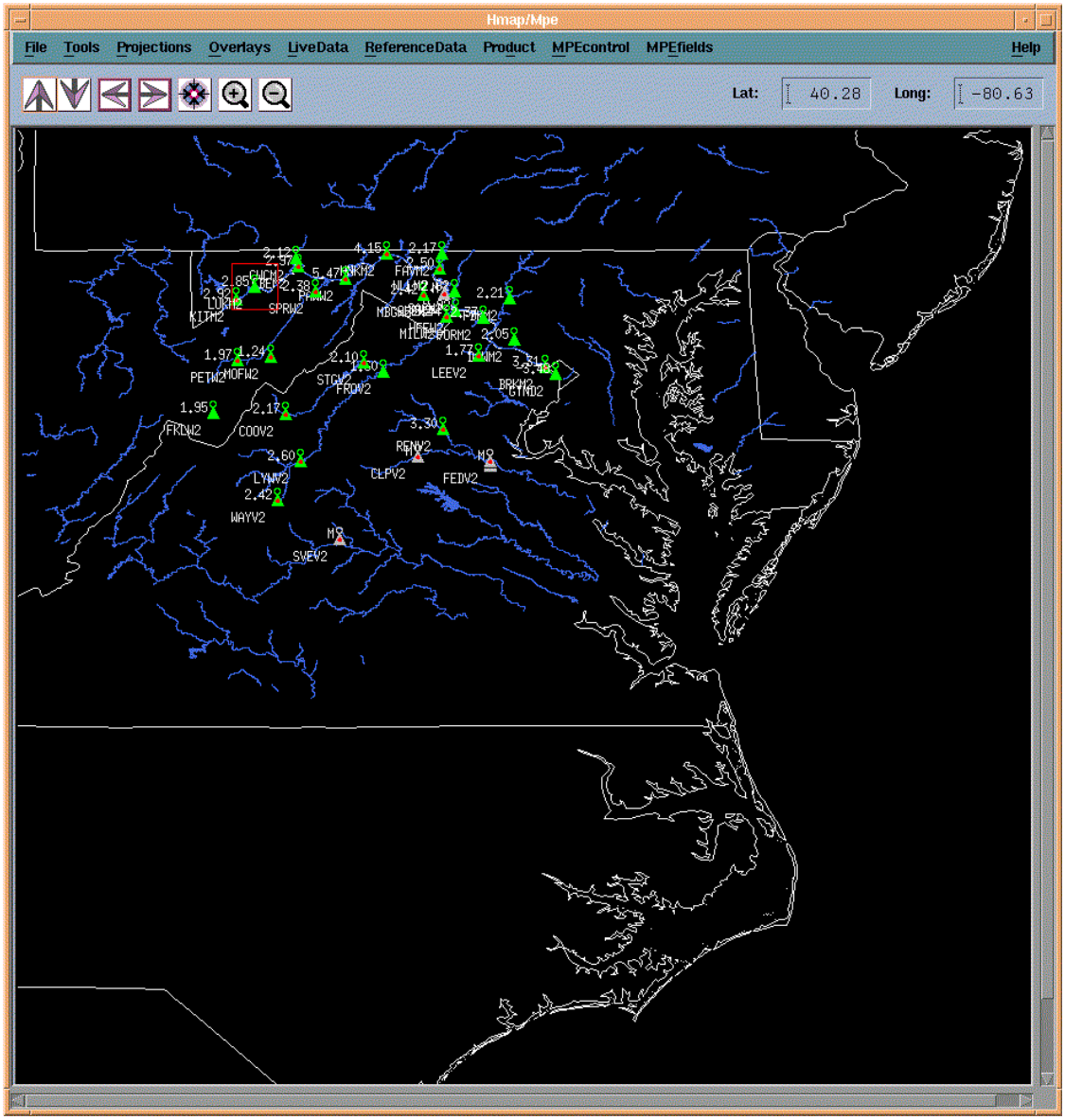

Figure 4. HydroView_MPE Root Window (with Toolbar)

The HydroView_MPE root window with the Pop Up Menu displayed is shown in Figure 5.

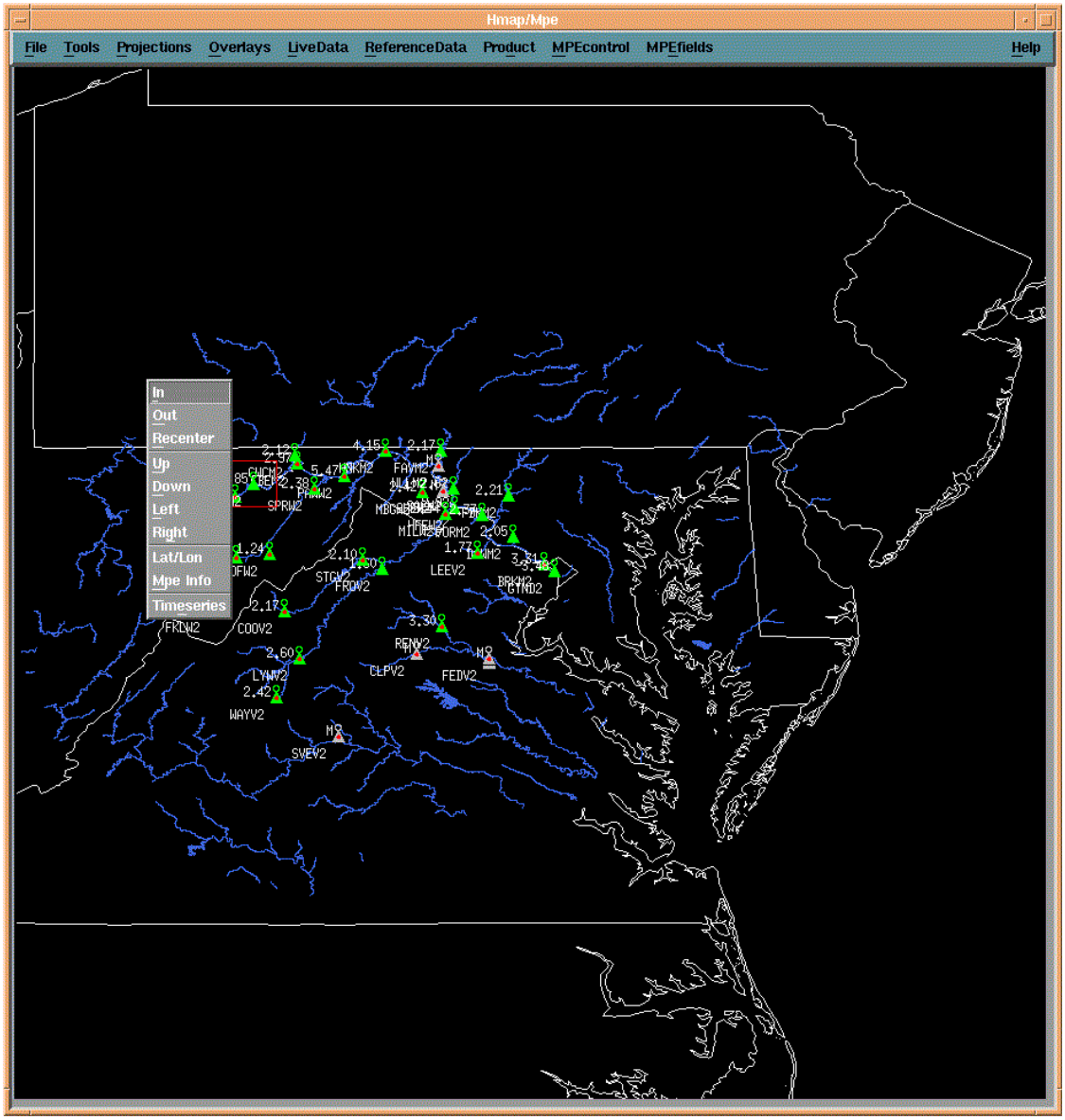

Figure 5. HydroView_MPE Root Window (with Pop Up Menu)

From the HydroView_MPE Root Window, the following can be accomplished.

From the Geographic Display

- View the location of the currently selected station;
- View point and areal data and information;
- View forecast point, data point and reservoir flood status (via color coded icons);
- Zoom out and recenter at the click point (single left button click);
- Zoom in and recenter at the click point (single middle button click);
- Select/deselect a station as the current station (double left button click);
- Select a station and launch the Time Series Control window for it (double middle button click); and
- Display the Pop Up menu (single right button click).

From the Map Toolbar

- Pan the map up or down;
- Recenter the map;
- Zoom the map in or out; and
- View the latitude and longitude of the currently selected station.

From the Menu Bar

- Select **File**
  - Capture the current map display as a gif-formatted file
  - Capture the current map display and output to printer
  - Capture the current map display as a reverse image and output to printer
  - Close the application;
- Select **Tools**
  - Zoom map displayed within viewer
  - Pan map displayed within viewer
  - Recenter map displayed within viewer
  - Toggle tool bar;
- Select **Projections** (for geographic display)
  - (Not currently implemented)
- Select **Overlays** (for geographic display)
  - Rivers, streams, and lakes
  - Basins, counties, county warning areas, RFC boundaries, states, and zones
  - Cities and towns
  - Highways and roads
  - Grids, latitude/longitude lines, and time zones
  - Radar locations and radar rings;
- Select **LiveData** (for use in display)
  - Point Display Control to filter the data information shown on the display
    - Type of data to display (identified by primary element, specific physical element, and specific type source)
    - Time frame of data to display (time mode, ending/center time, and hour)
    - Stations to be considered from the data set produced according to type and time frame instructions
    - Method of data display (on the geographical map or in tabular form)
    - River stage basis to use (observed and/or forecast)
    - Items to display when data is displayed on the map;
  - Flash Flood Guidance (from the RFC)
  - Time Series Control to initiate graphic or tabular time series displays
  - Alert and alarm data (data that have exceeded value and rate-of-change thresholds)
  - Questionable and bad data (data marked questionable or bad by the QC processes)
  - Rejected data trash can (manually or automatically rejected observations)
  - Station reporting status/latest observations (for all stations)
  - Point precipitation accumulations
  - Station profile (geophysical information and current stage data)
  - River summary (to run an application for viewing the river stages of station points along a single river or stream)
  - Site specific headwater model (to run a hydrologic model to generate a river stage forecast based upon observed and forecast rainfall amounts)

(Continued on next page)

From the Pop Up Menu

- Zoom the map in (**In**);
- Zoom the map out (**Out**);
- Recenter the map on the point of the next mouse click (**Recenter**);
- Pan the map up (**Up**);
- Pan the map down (**Down**);
- Pan the map left (**Left**);
- Pan the map right (**Right**);
- Turn the latitude/longitude information that follows the cursor on or off (**Lat/Lon**);
- Turn the MPE legend on or off (**MPE Info**); and
- Highlight the station clicked on and launch the time series control for it (**Timeseries**).

From the Menu Bar (cont.)

- Select **LiveData** (cont.)
  - Station selection (to choose a station from among those displayed according the the current Point Control options)
  - Refresh data (to update data and refresh station icons based on last 15-min. data);
- Select **ReferenceData** (for selected station)
  - Staff gage
  - Impact Statement (statements listed by stage)
  - Rating curve
  - Data sources (e.g., DCP, observer)
  - Contacts
  - Crest history
  - Text reports (generate reports and print and/or save to file)
  - Dam catalog;
- Select **Products** (for selected or other stations)
  - Product Viewer (text products in data base, e.g., gage reports, river statements, flood watches);
- Select **MPEcontrol** (for enabling, disabling and controlling display of MPE data)
  - Select the date and hour for MPE data to display (and turn on MPE mode)
  - Next hour's data
  - Previous hour's data
  - Save currently displayed data as "best estimated"
  - Clear MPE data from the screen (and disable MPE mode)
  - Regenerate MPE data (e.g., to produce a new best estimate)
  - Draw polygons to define precipitation areas
  - Select a specific radar site that provides coverage within the area
  - Control display of gages contained within the area's grid
  - Set up the data time lapse;
- Select **MPEfields** (for selecting MPE data and reference fields for display)
  - Raw radar mosaic
  - Field bias (raw radar mosaic with mean field bias applied)
  - Local bias radar mosaic (raw radar mosaic with local bias applied)
  - Precipitation as estimated by gages only
  - Multisensor mosaic (precipitation estimates from radar and gages)
  - Best estimate QPE (defaults to multisensor mosaic; user modifiable)
  - Multi-hour QPE (for summing hourly best estimate QPE products)
  - Memory span for computing local bias for grid bins
  - Local bias values for grid bins
  - Lowest available radar height for grid bins
  - Radar coverage for grid bins
  - PRISM data
  - Radar-specific biases for radar sites
  - Display 7 x 7 (7 x 7 grid of bins centered on a precipitation gage); and
- Select **Help**
  - MPE map legend.

RiverPro

The River Product Formatter (RiverPro) is designed to assist the forecaster in disseminating hydrologic information to the public by automatically generating and issuing standardized NWS hydrologic products. The software provides the forecaster with recommended products and recommended forecast points to include in each product. RiverPro gives the forecaster the flexibility to accept and issue the recommended products or to edit the product prior to its issuance.

RiverPro would typically be started after the forecaster has evaluated the hydrologic conditions using HydroView_MPE. This evaluation is necessary to ensure that the products issued to the public are of the highest quality. RiverPro is not started automatically - it must be initiated by the forecaster.

Key features of RiverPro include the following.

- The forecaster can generate and issue the following hydrologic products with RiverPro:
  - River Statements (RVS),
  - Flood Warnings (FLW),
  - Flood Statements and Terminating Flood Statements (FLS),
  - Other products as defined locally;
- The forecaster has the option to accept the recommendation from RiverPro or to customize the recommendation by specifying which product to issue and which forecast points to include in the statement or warning;
- The forecaster has the ability to add text to the FLW and FLS products to further define the basis for the warnings and statements;
- The forecaster has the option to edit the content of the product by modifying the message text; and
- RiverPro products are formatted to provide information in a plain language text format as well as pertinent data regarding observed and forecast stages and status compared to past crests and floods.

RiverPro extracts both static and dynamic data from the hydrologic database. Static data include forecast point names and their respective groupings plus information found in WS Form E-19, *Report on River Gage Stations*, (e.g., impact statements and historical crests).
Dynamic data include observed and forecast river stage data plus carryover data (not to be confused with carryover data as applied in the context of the NWS River Forecast System) from previously issued RiverPro products for each forecast point. (Carryover information from previous executions of RiverPro include stage information associated with the previous product in which a specific forecast point was last included and the time and type of the previous product. These carryover data must be saved so that recommendations for subsequent runs have continuity. The carryover information is compared with current values to help determine the recommended product and the forecast points to include.)

RiverPro analyzes forecast and observed data, then determines derived values from stage time series data (e.g., maximum forecast value). Using this derived information, RiverPro automatically determines the recommended product to issue and the recommended forecast points to include. RiverPro creates products based on the following:

- WS Form E-19 (*Report on River Gage Stations*) information, carryover information from previous RiverPro products, and current river stage data, which are read and analyzed to compute various derived values (e.g., maximum forecast stage);

- Input data and RiverPro-computed values, which are also used to determine the recommended product to generate and the forecast points to include; and

- Pre-defined instructions that specify how products are generated (e.g., certain instructions define the appropriate set of text templates to use).

RiverPro then generates the product.

RiverPro creates river products that are constructed and formatted properly for the auto-voice NOAA Weather Radio (NWR). Users can set up templates for NWR and non-NWR products.

All activities in RiverPro begin with the Root Window screen. This window, which is shown in Figure 6, provides the base from which all RiverPro capabilities can be exercised.

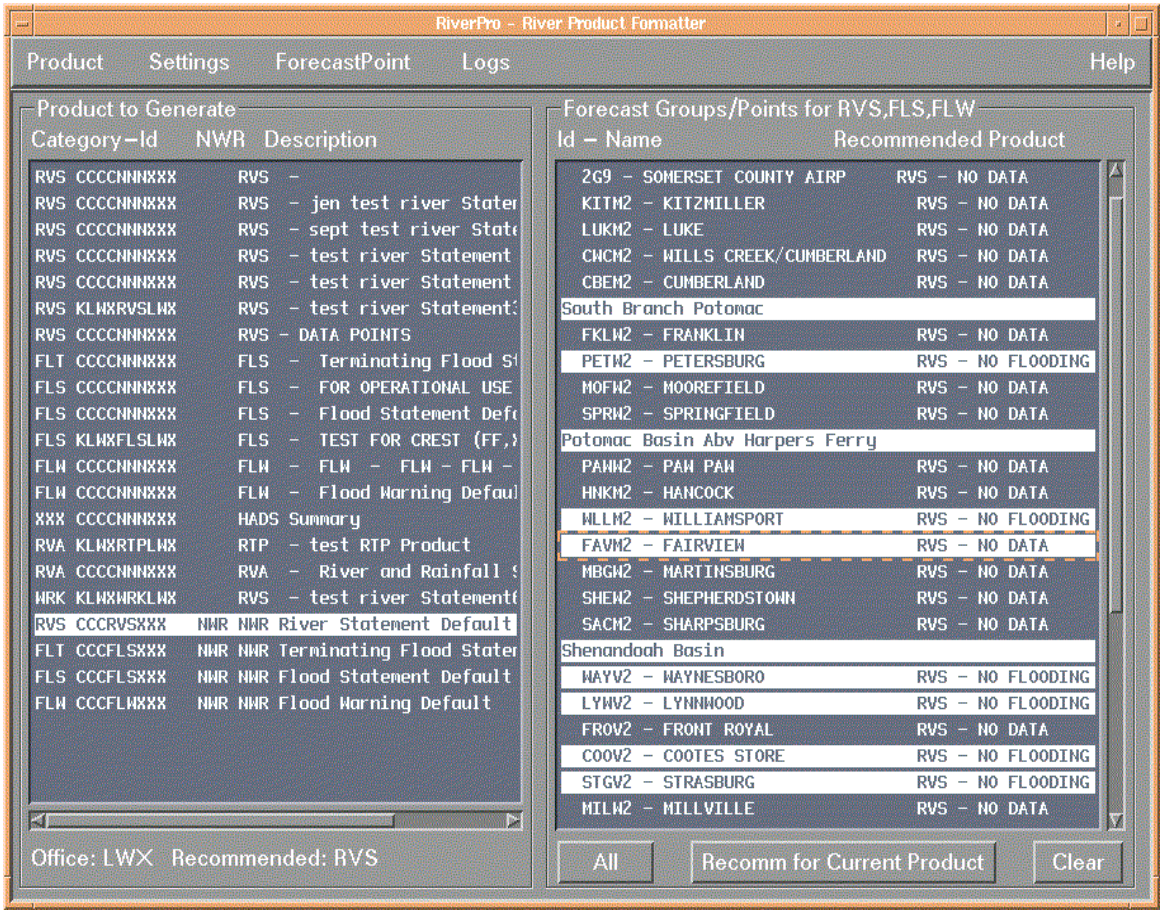

Figure 6. RiverPro Root Window

The RiverPro Root Window contains the following features:

- **Text displays** identifying selectable hydrologic products to be generated;
- A **Recommended Product Display** identifying the RiverPro recommended product;
- A **Forecast Groups/Points Display** identifying forecast points and groups to include in the product; and
- A **menu bar** across the top of the window displaying RiverPro menu options.

RiverPro recommendations for hydrologic products are based on current observed data and/or RFC forecast products stored in the database and the past history of products issued for the included river forecast points.

From the RiverPro Root Window, the following can be accomplished.

From the Text Displays

- View the products available to be issued, including the recommended hydrologic products;
- Select and edit a non-recommended product; and
- Review recommended forecast points and select forecast points and groups to include in the product.

From the Menu Bar

- Select **Product**
  - Create the selected product
  - Edit the selected product
  - Issue the selected product
  - Issue a test version of the selected product to a data file
  - Exit RiverPro;
- Select **Settings**
  - Modify product generation settings
    - Product sections/subsections to include
    - Order of product sections
    - Order of forecast point subsections
    - Data usage (defaults, QPF, out-of-range data)
    - Product type (NWR, official non-segmented, official segmented)
    - Product time zone display
    - Upper/lower case for product text
  - Modify VTEC settings
  - Reset to recommended (default) product generation settings
  - Save product generation settings to a file
  - Delete a settings file
  - Select office;
- Select **ForecastPoint**
  - View stage and discharge data for all recommended (by RiverPro) and included (by the forecaster) forecast points
  - View recommendation information for all recommended and included forecast points plus segregated RVS, FLS (terminating), FLS, and FLW recommended points
  - View previous product information for all included forecast points plus segregated RVS, FLS (terminating), FLS, and FLW previous points
  - View WS Form E-19 information for all and included forecast points; and
- Select **Logs**
  - View previous product log
  - View the message log (general status information plus product issuance information, including warnings and errors)
  - View the product issuance log (messages generated during issuance of products, including warnings and errors).

A sample RiverPro product is shown in Figure 7.

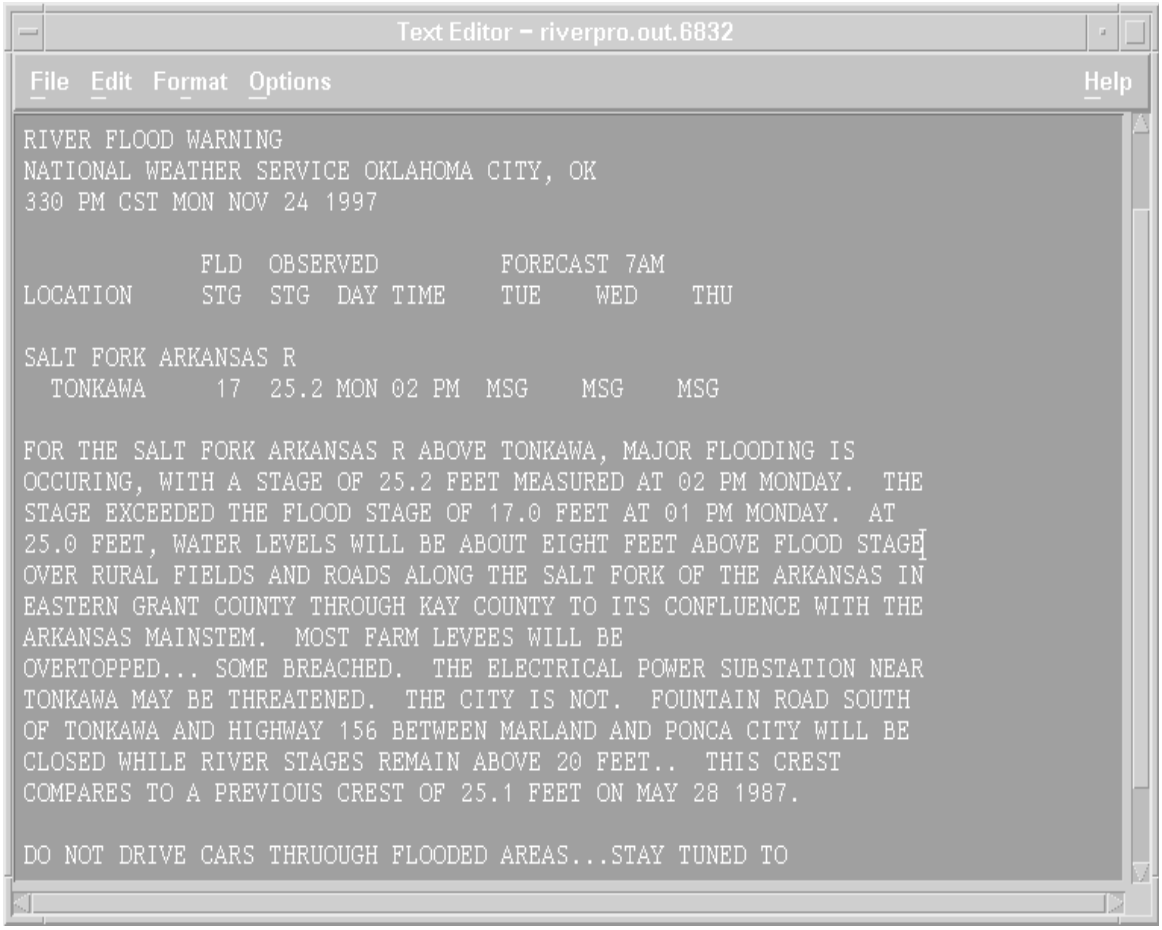

Figure 7. Sample RiverPro Product

While this manual focuses only on the user interface, the functional aspects of RiverPro are detailed in the *RiverPro Reference Manual*.

HydroBase

The Hydrologic Database (HydroBase) is an interactive component of the WHFS that is used to display, edit, and add static information about the hydrometeorological data locations, river forecast points, and other pertinent information in the hydrometeorological database. The main purpose of HydroBase is to provide an interface to this parametric information, which is used by HydroView, RiverPro, and other applications. The WHFS is supported by the Informix relational database (Integrated Hydrologic Forecast System data base, IHFS_DB) deployed to both WFOs and RFCs. HydroBase acts as the interface between IHFS_DB and the components of the WHFS.

This manual addresses some of the basic functional uses of HydroBase - the routine display, edit, and addition of hydrometeorological data and information. HydroBase can also be used operationally to update static data and information as needed (e.g., to update flood history information when a record has been exceeded during an event), although normally only the Service Hydrologist will perform this function. HydroBase must be completely set up and all information be checked for accuracy prior to using HydroView or RiverPro. During normal operations, HydroBase operations will be transparent to the WHFS user.

Maintenance of the static information in the IHFS database is generally the responsibility of the Service Hydrologist or designee. Access to the database should be limited within the WFO through use of the **optional password function** in order to ensure its integrity. The password is set in HydroBase. More information on the password function is provided in Chapter 5 of this manual.

The key feature of HydroBase is the capability to display and edit the following types of static data and information used by HydroView and RiverPro.

- Hydrometeorological Data Locations and River Forecast Points
  - Station location (e.g., contacts, county, data sources);
  - River gage (e.g., flood information, impact statement, rating curve, unit hydrograph, datum, history);
  - Dam information and data including pre-calculated forecasts of flow, stage, and travel time for a dam break; and
  - Reservoir (e.g., type, elevations, pools, uses).
- Reference Data Information
  - Cities (e.g., coordinates, population);
  - States/counties/zones;
  - Forecast groups;

- Radar locations;
- Stage II parameters;
- Areal and vector definitions;
- NOAA Weather Radio transmitter towers; and
- Time series group configuration.

HydroBase allows for the editing and managing of some RiverPro parameters such as the number of look back hours for observed data, look ahead hours for forecast data, and the default number of hours before product expiration. In addition, HydroBase can be used to define forecast groups and to order the groups and forecast points for tailoring the RiverPro display and generated products. HydroBase can also be used to select the primary stage parameter for RiverPro to use for each forecast point.

HydroBase can be used to review and edit the incoming data ingest filters, quality control checks, and data purge parameters.

HydroBase provides the capability to print or save to a file the following reports:

- Flood history reports for river gages and reservoirs (display only, no editing permitted);
- WS Form E-19 and WS Form E-19A (*Report on River Gage Station*);
- WS Form B-44 (*Unofficial Cooperative Station Report*); and
- Service backup list.

All of the information on dams in the Dam Catalog can be viewed as well as edited in HydroBase (this information can only be viewed in HydroView). The static data in Dam Catalog is derived directly from the 1993-1994 *National Inventory of Dams* distributed by the U.S. Corps of Engineers. The dam break scenario data in Dam Catalog was computed by the Hydrologic Research Laboratory using a simplified dam break model for only one scenario for one point downstream of the dam. The WHFS database has been configured to allow multiple dam break scenarios for multiple downstream points should that information be available. Using the Reservoir and Dam Catalog dialogs in HydroBase, reservoirs can be associated with specific dams for reference.

All activities in HydroBase begin with the Root Window screen. This window, which is shown in Figure 8, provides the base from which all HydroBase capabilities can be exercised.

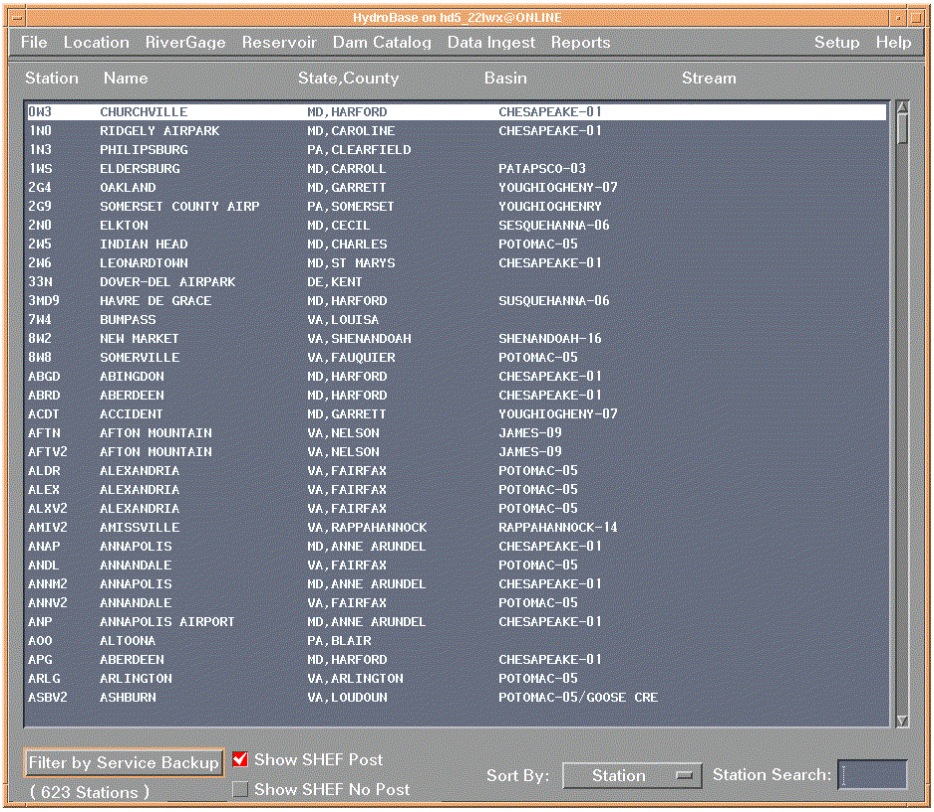

Figure 8. HydroBase Root Window

The HydroBase Root Window contains the following features:

- A **text display** listing all data stations in the HSA (hydrometeorological, river gage, and reservoirs) and their associated county, basin, stream, or latitude and longitude;
- A **menu bar** across the top of the window displaying the HydroBase menu options; and
- **Sort and search utilities** at the bottom of the window for use with the text display.

The Menu Bar is used to access screens to input new or modify existing data and information in HydroBase.

From the HydroBase Root Window, the following can be accomplished.

From the Text Display

- View all hydrometeorological data stations, river gage stations, and reservoirs in the HSA and
- View station information (identifier, county, basin, stream).

From the Sort and Search Utilities

- Sort the Text Display by station, name, or county and
- Perform a quick search using the station identifier rather than scrolling for a station.

Filter Options

- Filter by WFO list, primary list, or secondary list.

SHEF Display Options

- Show or don't show SHEF Post and/or SHEF No Post

From the Menu Bar

- Select **File**
  - Preferences (for Text Display)
  - Add or remove Quick Reference Tool Bar
  - Exit HydroBase;
- Select **Location**
  - Add location
  - Modify location (for a selected station)
  - Contacts (for a selected station)
  - County and zone UGC configuration (for a selected station)
  - Data sources (DCP, observer, telemetry);
- Select **RiverGage** (for a selected river gage station)
  - River gage (geophysical and additional information)
  - Flood category (define categories - major, moderate, minor)
  - Impact statement (organized by stage)
  - Flood damage (expected damage organized by stage)
  - Rating curve
  - Unit hydrograph
  - Crest history (maximum flows)
  - Low water (minimum flows)
  - Benchmark (where applicable)
  - Datum (elevation of gage zero)
  - Description
  - Gage history
  - Publications
  - References;
- Select **Reservoir** (for a selected reservoir station) - Information, elevations, pools, association with a dam in Dam Catalog;
- Select **Dam Catalog** - General, physical, agency, reservoir, and dam break information;
- Select **Data Ingest**
  - Ingest filter (set incoming data filter parameters)
  - QC/alert/alarm limits (set quality control parameters)
  - Purge parameters (set data and product purge parameters);
- Select **Reports** (for a selected station)
  - Flood report (specific flood event time series)
  - Text reports (E-19s, B-44A, station list, station class, service backup); and
- Select **Setup** (for HSA-specific information)
  - Administration
  - Cities
  - Reference fields
  - States/counties/zones
  - RiverPro general parameters
  - RiverPro Forecast Groups/Points
  - Radar locations
  - Stage II parameters
  - Areal definitions (zones, counties, basins, reservoirs)
  - Vector definitions (rivers, streams, highways, roads for geographical display)
  - NWR transmitter towers
  - Time series group configuration.